

**UNITED STATES PATENT AND TRADEMARK OFFICE**

**Applicants:** Donald R. Huffman, et al.

**Examiner:** Tsang Foster, S.N.

**Serial No.:** 08/236,933

**Art Unit:** 1745

**Filed:** May 2, 1994

**Docket:** 7913ZAZY

**For:** NEW FORM OF CARBON

**Confirmation No.:** 4115

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION OF MAURICIO TERRONES  
PURSUANT TO 37 C.F.R. §1.132**

Sir:

I, MAURICIO TERRONES, declare and say as follows:

1. I am a full professor at the Instituto Potosino de Investigación Científica y Tecnológica (IPICYT) in San Luis, Potosí, Mexico. I was awarded a Ph.D. at the University of Sussex, England in 1997 where I did my doctoral studies under the supervision of Professor Harold W. Kroto. For over 10 years, I have been conducting research in carbon nanoscience and nanotechnology. I have written over 176 articles in prestigious journals in the areas of carbon nanostructures and nanoscience and technology, and I have given several oral presentations on these subjects. Further, I have received several awards for my research work. For the convenience of the United States Patent and Trademark Office, I have attached hereto as Exhibit 1 my *curriculum vitae*, describing my credentials and expertise in the area of fullerenes and carbon nanostructures and carbon nanoscience and technology.

2. In preparing this Declaration, I have read and reviewed the contents of USSN 08/236,933 (“ ‘933 application”), especially the description therein of the preparation of fullerenes, including C<sub>60</sub> and C<sub>70</sub>, and especially Examples 1-3 thereof.

3. I was introduced to applicants’ attorney by Dr. Harold W. Kroto.

4. I was requested by applicants’ attorney to prepare fullerenes, including C<sub>60</sub> and C<sub>70</sub>, by repeating the experiments described in the ‘933 application utilizing the same apparatus and conditions as described therein. In particular, I was asked by applicants’ attorney to prepare the fullerenes by following the procedure in the ‘933 application at two different pressures, viz., at 100 torr and 2 atm, using a current of 100 amps.

5. Dr. Kroto coordinated the research on behalf of the applicants. He instructed me to prepare the soot by the techniques described in the ‘933 application. In an effort to meet the time requirements of the United States Patent and Trademark Office, I was instructed to forward the soot produced from the vaporization of graphite at 100 torr and at 2 atm to Dr. Adam Darwish, whom I understand would carry out the separation of the fullerenes from the soot.

6. I note that the bell jar apparatus described in the ‘933 application is no longer available or being used to produce fullerenes. In order to perform the experiments as described in the ‘933 application, I had to rebuild a bell jar apparatus in order to make it operational. Further, I adapted an aluminum chamber for high pressure experiments by replacing the glass container of the bell jar with an aluminum container in order to provide for safe operation at the increased pressure of 2 atmospheres, in accordance with the description in the ‘933 application.

7. The construction of the apparatus and the set-up of the experiments for the preparation of the soot, and the experiments performed using the bell jar apparatus and

aluminum reactor, as described in this Declaration, were either conducted by me or were conducted under my direct supervision and control.

8. The bell jar apparatus which was built was identical to the one described in the '933 application. However, it had one constraint. It could only be used to vaporize carbon for about 2 minutes and then had to be cooled down (for a few minutes) before another run could be conducted. In addition, the glass container of the bell jar was not thick enough and did not have proper stoppers for conducting high-pressure experiments. Therefore and in order to conduct the vaporization of graphite at the higher pressures of 2 atmospheres, as described in Paragraph 6, I modified the bell jar apparatus by replacing the glass cover of the bell jar apparatus with an aluminum chamber, which was adapted with stoppers and bolts/nuts to keep the aluminum cover in place for high pressure operation (hereinafter this modified bell jar apparatus with an aluminum cover will be referred to as an "aluminum reactor"). This aluminum reactor was equivalent to the bell jar apparatus described in the '933 application; moreover, the aluminum reactor had the same constraints as those described hereinabove with respect to the bell jar apparatus. Thus, the vaporization of the graphite to form the soot was conducted for no longer than about 2 minutes at the lower pressure and for considerably less time at the higher pressure. In fact, the vaporization at 2 atm was performed in two or three segments, each no longer than about 25 sec. These short operation times for high pressure experiments were performed to guarantee stable pressures during the graphite vaporization experiments.

9. The soot was produced in accordance with the procedure described in the '933 application, especially Examples 1 and 2 therein. Accordingly, 1 gram of soot was produced by performing several runs at the lower pressure; about 100 mg., on average, of soot was obtained from each run.

10. The procedure for preparing the soot at 100 torr was performed in accordance with the description in the '933 application. The following is a general procedure for each run.

Graphite rods were heated via resistive heating in a bell jar, which was evacuated to  $10^{-4}$  torr and then filled with high purity helium. The system was evacuated three times before filling the chamber with helium. Pure graphite rods of  $\frac{1}{4}$  inch in diameter were utilized. The length of each rod varied, generally ranging from about 3 to 4 cm; moreover, a one-centimeter length of the tip of each rod was reduced in diameter to about 5 millimeters. The graphite rods were evaporated by resistive heating at 100 torr helium using a current of 100 amps.

The graphite rods were heated under resistive heating for about 2 minutes. The vapor was collected on a substrate, an aluminum sheet (used as a collector) in a semicircular configuration, which was placed about 4.7 cm from the bottom of, 7.57 cm to the right of, and 11 cm from the top of, the evaporating carbon rods. The bell jar apparatus was opened after the cooling down period of 20 minutes, and the black soot thus formed was removed by scraping the soot from the substrate surfaces and internal surfaces of the bell jar apparatus.

Generally about 100 mg. of soot, on average, were collected from each run. This was repeated until 1 gram of soot was collected, and the soot was forwarded to Dr. Adam Darwish for separation of the fullerenes therefrom.

11. Photographs of the set-up of the bell jar apparatus are attached hereto as Exhibit 2.

12. In order to produce the soot at the higher pressure, the procedure outlined in Paragraph 10 was repeated, except the pressure was raised to 2 atm. In addition, as indicated hereinabove, the aluminum reactor described above was utilized in lieu of the bell jar apparatus. The procedure is outlined below.

13. The graphite rods were vaporized in the aluminum reactor that had been evacuated to  $10^{-4}$  torr and then filled with high purity helium. The entire system was evacuated three times before it was filled with helium.

Graphite rods of  $\frac{1}{4}$  inch in diameter were utilized but they had a longer length of about 10.2 cm at the cathode and 4.7 cm at the anode. A one-centimeter length at the tip of each rod was reduced in diameter to 5 millimeters.

The graphite rods were vaporized via resistive heating at 2 atm under a current of 100 amps for about 1 minute, divided into three time periods: 25 seconds, 13 seconds, and 22 seconds. The vapor was collected on a substrate (aluminum sheet in semi circle), which was placed about 4.7 cm below, 7.57 cm to the right of, and 11 cm on top of, the evaporating carbon rods. The evaporator was opened after the cool down period of 20 minutes, and the black soot was removed by scraping the soot from the substrate surfaces and the internal surfaces of the aluminum reaction. Approximately 100 mg. of soot was collected.

14. In order to meet the time constraints imposed by the United States Patent and Trademark Office, there was no attempt to amass the soot at the higher pressure to obtain a large amount of soot, as performed for the lower pressure experiments.

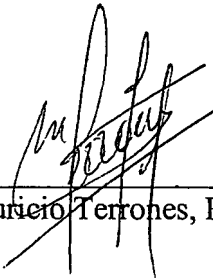
15. Photographs of the set up at the higher pressure of 2 atm are attached hereto as Exhibit 3.

16. The soot produced at the higher pressure was also forwarded to Dr. Adam Darwish for separation of the fullerenes therefrom.

17. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so

made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 28, AUGUST 2007

  
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Mauricio Terrones, Ph.D.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Applicants:** Donald R. Huffman, et al.                      **Examiner:** Tsang Foster, S.N.  
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Sir:

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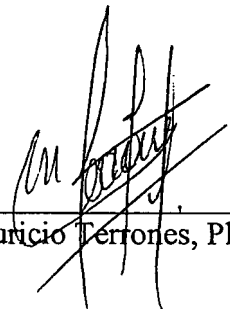
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made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 28 AUGUST 2007

  
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Mauricio Terrones, Ph.D.

Mauricio Terrones is a native of Mexico City born in 1968, obtained his B.Sc. degree in Engineering Physics at Universidad Iberoamericana (1992, Mexico City). He received the highest grade point average (GPA) award and the highest recognition for his B.Sc. Thesis ("Mención Honorífica"). In that year, he was also awarded a Medal for being one of the best students of México (a recognition given by the Mexican President). After lecturing at Universidad Iberoamericana for two years, in 1993 he was awarded a Fulbright fellowship to carry out doctoral studies in the USA. However, he did not take this fellowship and preferred to travel to the UK and work for a Ph.D. with Prof. Harold W. Kroto (Nobel Prize Winner in Chemistry 1996). He pursued his graduate studies fully sponsored by CONACYT-Mexico. In 1997, he obtained his doctorate degree and started to work as a postdoctoral research fellow at the University of Sussex. After a postdoctoral year, funded by the Materials Research Laboratory (UC-Santa Barbara) and the Royal Society, he was appointed Research Fellow at the Fullerene Science Centre and was funded by the Royal Society.

In 1999, Mauricio Terrones returned to Mexico and became a faculty member as Assistant Professor "category A", at the Institute of Physics –UNAM (Mexico). In 1999, he was also awarded an Alexander von Humboldt Fellowship to carry out research at the Max-Planck-Institut für Metallforschung in Stuttgart (Germany). In April 2001, he became full Professor (category "C") at the Instituto Potosino de Investigación Científica y Tecnológica (IPICYT). Mauricio Terrones has co-authored more than 175 publications in prestigious international journals such as *Nature* (3), *Science* (3), *Nature Nanotechnology* (1), *Physical Review Letters* (9), *Nano Letters* (16), *Chemical Physics Letters* (35), *Annual Reviews of Materials Research* (1), *Advanced Materials* (6), *International Materials Reviews* (1), etc. He has been awarded the UNESCO Javed Husain Prize for Young Scientists and received the Albert Einstein Medal in November 2001 for his numerous contributions in Carbon Nanoscience and Nanotechnology. In 2001, he also received the National Prize for Chemistry in Mexico for his work on Carbon Nanoscience. His work has also been recognized by various agencies and Magazines in Mexico (e.g. Mexican Achievers 2004, Top 30 outstanding young people by "Revista Expansión", Outstanding Young Mexicans by "Revista Dia Siete", etc). In 2005, he received the José Antonio Villaseñor prize (a recognition given by the State government of San Luis Potosí) for his contribution to the production of N-doped carbon nanotubes and his applications. In that year, he was also awarded the TWAS prize (given by the Academy of Sciences for the Developing World) in Engineering for his outstanding contributions to the synthesis and characterization of novel carbon-based nano-materials. Mauricio Terrones is the youngest scientist ever to win a TWAS Prize. In 2005, he was elected member of the TWAS. In April 2006, he was awarded by UNAM the "Fernando Alba" medal for his outstanding contributions to experimental physics.

The scientific impact and quality of his publications has given him more than 3500 independent citations (without auto-citations) in international journals and books. In addition, he has co-edited a special issue on *Nanoscience and Nanotechnology of Carbon* that was published in November 2004 by Philosophical Transactions (The Royal Society). He has also written 8 book chapters, 2 independent reviews, 19 articles in conference proceedings and 6 miscellaneous publications. He has presented his research in more than 90 international conferences. The average impact factor of his publications is  $>4$ , according to the Institute for Scientific information 1998. He has been invited to present his research in more than 60 international conferences (i.e. England, Austria, USA, Hungary, Belgium, Argentina, Brazil, Chile, Korea, Germany, Japan, etc.) devoted to nanotubes.

Mauricio Terrones is one of the most productive scientists in Mexico, and has closely participated in the creation of the first Fullerene and Nanotube Laboratory in Mexico (Departamento de Física Aplicada y Tecnología Avanzada, UNAM). He has set-up the new Nanoscience Laboratory at IPICYT and is now leader of the National Laboratory for Nanoscience and Nanotechnology Research (LINAN), recently approved by CONACYT-Mexico.

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# **CURRICULUM VITAE**

**Mauricio Terrones**

**Professor Mauricio Terrones**  
**Potosí Institute of Science and Technology (IPICYT)**  
Camino a la Presa San Jose 2055  
C.P. 78216, San Luis Potosí, Mexico  
Home Tel: +52 (444) 825-6596  
Work Tel: +52 (444) 834-2039; Fax: +52 (444) 834-2040  
e-mail: [mterrones@ipicyt.edu.mx](mailto:mterrones@ipicyt.edu.mx)

#### **I. PERSONAL DATA**

Date of Birth: 28 November 1968.  
Place of Birth: Mexico City.  
Nationality: Mexican.  
Marital Status: Married (Elizabeth FLORESGOMEZ); Son (Diego TERRONES)  
Address: Cordillera Occidental 760; Depto. 4  
Col. Lomas 4ª. Sección  
San Luis Potosí, SLP. C.P. 78216  
Telephone Number: ++52 (444) 825-65-96

#### **II. EDUCATION**

1997 **Ph.D.** University of Sussex, England  
Major: Chemical-Physics  
Thesis: "Production and Characterisation of Novel Fullerene-related Materials: Nanotubes, Nanofibres and Giant Fullerenes".  
Thesis Supervisors: Prof. H. W. Kroto, FRS (Nobel Laureate), Dr. D. R. Walton, FRSC  
1992 **Licenciatura (B.Sc. by Thesis)** Universidad Iberoamericana, México City, México.  
Grade Point Average: 9.62/10  
Major: Engineering Physics  
Minor: Thermo-Fluids  
Thesis: "Parametric Study of a Photochemical Reaction Modelled by an Integro-Differential Reaction Diffusion Equation".  
Thesis Supervisors: Dr. Leopoldo García Colin Sherer, Dr. Guillermo Terrones.  
1984 **High School.** Universidad La Salle, México City, México.  
Grade Point Average: 9.92/10  
1981 **Junior High School** (Junior High School). Instituto Ingles Mexicano, México City, México.  
Grade Point Average: 9.6/10  
1975 **Elementary School** (Elementary School). Instituto Ingles Mexicano, México City, México.  
Grade Point Average: 9.4/10

#### **III. EXPERIENCE**

##### **Research**

Apr. 2001- Full Professor (Tenure) at the Instituto Potosino de Investigación Científica y

present	Tecnológica IPICYT (San Luis Potosí, México).
Apr. 2004 Jun. 2004	Invited professor Université Catholique de Louvain la Neuve & Université de Namur, Belgium (April 2004 – June 2004).
Jan. 2004 Mar. 2004	Visiting Director of the International Center for Young Scientists (ICYS) at the National Institute of Materials Science (NIMS), Japan.
Oct. 1999- Dec. 2000	Alexander von Humboldt Fellowship tenable at the Max Planck Institut für Metallforschung (Stuttgart). Research Programme entitled: "Structural and dynamic behaviour of metals encapsulated in nested fullerenes and nanotubes".
Mar. 1999- Mar. 2001	Associate Professor at the Institute of Physics - UNAM-Mexico. Department of Applied Physics and Advanced Technology (Queretaro, Mexico).
Jun. 1999- present	Associate Research Fellow at Birkbeck College - Department of Crystallography (University of London). Structural Characterisation of nanomaterials.
Jan. 1999- Jun. 1999	Research Fellow at the University of Sussex sponsored by the Royal Society. Research Programme entitled: "Novel graphite-like structures" under the supervision of H. W. Kroto (FRS).
Nov 1997- Dec. 1998	Research Fellow at the Fullerene Science Centre sponsored by the Materials Research Laboratory (University of California Santa Barbara) and the Royal Society. Controlled production of nanomaterials and applications.
Jul. 1997- Oct. 1997	Research Fellow (Fullerene Science Centre) at the School of Chemistry, Physics and Environmental Sciences, University of Sussex. Nanotubes and other forms of Carbon.
Jan. 1994- Jun. 1997	School of Chemistry, Physics and Environmental Sciences, University of Sussex. Application of molecular simulations, and diffraction and spectroscopic techniques to the physico-chemical study of fullerenes, nanotubes and new graphitic structures.
Jan. 1991- Dec. 1993	Department of Physics, Universidad Iberoamericana Asymptotic analysis to determine the existence of travelling wave solutions in a single step photochemical reaction. Finite difference methods for non-linear parabolic-type partial differential equations.

### Teaching

Aug. 1992- Dec. 1993	<p>Profesor de Asignatura (<u>Instructor</u>) Department of Physics: Universidad Iberoamericana.</p> <p>Teaching the following freshman courses (1st. and 2nd. year):</p> <ul style="list-style-type: none"> <li>* <u>Mechanics</u> (Theory and Laboratory)</li> <li>* <u>Thermodynamics</u> (Theory and Laboratory)</li> <li>* <u>Continuum Mechanics</u> (Theory)</li> <li>* <u>Electricity and Magnetism</u> (Laboratory).</li> </ul>
Jan. 1992- Dec. 1993	<p>Profesor de Asignatura (<u>Instructor</u>) Department of Mechanical Engineering, Universidad Iberoamericana.</p> <p>Thermodynamics Engineering (Laboratory).</p>



- May 1992      Design of new experiments for instruments for instructional purposes for the following laboratories: Electricity and Magnetism, Mechanics and Thermodynamics Engineering.
- Jan. 2001      Lecturer in Physical Chemistry at the University of Sussex –  
Mar. 2001      Department of Chemistry, Physics and Environmental Science (UK).  
Teaching Modern Materials (3<sup>rd</sup> year undergraduate).
- Aug. 2002-      Advanced Materials Department (IPICYT), Teaching:  
Dec. 2003      Tópicos Avanzados de Materiales I  
Investigación Doctoral I
- Jan. 2003-      Advanced Materials Department (IPICYT), Teaching:  
Jun. 2003      Tópicos Avanzados de Materiales II  
Investigación Doctoral I  
Investigación Doctoral II
- Aug. 2003-      Advanced Materials Department (IPICYT), Teaching:  
Dec. 2003      Materiales Nanoestructurados y Laboratorio  
Tópicos Avanzados de Materiales I  
Investigación Doctoral I  
Investigación Doctoral III
- Jan. 2004-      Advanced Materials Department (IPICYT), Teaching:  
Jun. 2004      Temas Selectos de Ciencias Físicas  
Investigación Doctoral I  
Investigación Doctoral II  
Investigación Doctoral III  
Investigación Doctoral IV
- Jan. 2004-      Profesor de Asignatura (Instructor) Department of Physics and  
May. 2004      Mathematics. Universidad Iberoamericana.  
Teaching courses (3<sup>rd</sup> & 4<sup>th</sup> year):  
\* Física de Materiales (Theory)
- Aug. 2004-      Advanced Materials Department (IPICYT), Teaching:  
Dec. 2004      Materiales Nanoestructurados y Laboratorio  
Tópicos Avanzados de Materiales I  
Investigación Doctoral V  
Investigación Doctoral VI

#### PhD Students (Graduated)

1. **Julio Alejandro Rodríguez Manzo**. (Ph.D. IPICYT, México). Title: "Magnetismo un Nanoestructuras de Carbono y Cuasicristales". Termination February 2007.
2. **Benjamín Fragneud** (Ph.D. IPICYT, México) Title: "Síntesis y Caracterización de Materiales Compuestos Polímero/Nanotubo de Carbono: Impacto del Injerto de Polímero a la Superficie de los CNx MWNTs sobre las Propiedades Eléctricas y Mecánicas de los nano-compuestos". Thesis written in English. Termination December 2006.
3. **J. Jesús Velásquez Salazar** (Ph.D. IPICYT, México) Title: "Síntesis y Caracterización de Nanotubos por molienda mecánica". Termination November 2006.
4. **Eduardo Terrés Rojas** (Ph.D. IPICYT, México) Title: "Síntesis, Caracterización y propiedades electrónicas y catalíticas de Nanomateriales porosos de carbono". Termination October 2006.
5. **Adalberto Zamudio Ojeda**. (Ph.D. IPICYT, México). Title: "Síntesis y

- Caracterización de Nanoestructuras de Carbono y Anclaje de Nanopartículas de Plata en Nanotubos de Carbono: Teoría y Experimento". Termination September 2006.
6. **Ana Laura Elías Arriaga (Ph.D. IPICYT, México)** Title: "A Multidisciplinary Study of Carbon Nanotube Structures: From Inorganic to Biological Systems". Thesis written in English. Termination July 2006.
  7. **Felipe Valencia Hernández (Ph.D. IPICYT, México)** Title: "Stability of Curved and Highly Starined Carbon Nanostructures and their interaction with laser excitatcion". Thesis written in English. June 2005.
  8. **Marisol Reyes Reyes. (Ph.D. UNAM and IPICYT, México).** Title: "Microscopía Electrónica y estudio Experimental de nanoalambres de carbono". Date of Exam 12<sup>th</sup> November 2003.
  9. **Torsten Seeger (Ph.D., Max-Planck Institut für Metallforschung, Germany).** Title: "Synthesis and characterization of model composites made of multiwall nanotubes and SiO<sub>2</sub>". October 2001. Co-supervsion with Prof. Manfred Rühle.

#### **Masters and Undergraduate students (Graduated)**

3. **Xavier Lepró (M.Sc. IPICYT, México).** Title: "Attachment of Transition Metal Nanoparticles on Nitrogen Doped Carbon Nanotubes (MWNTs-CNx) and their Further Reactions". Thesis written in English. Termination September 2006.
4. **Jaime Enrique Pérez Terrazas (M.Sc. IPICYT, México).** Title: "Estudios Estructurales de C<sub>60</sub> Polimerizado mediante tratamiento de presión y Temperatura usando dinámica molecular". Thesis written in English. Termination July 2005.
5. **Pedro Armando Ojeda May (M.Sc. IPICYT, México).** Title: "Determinación de la Quiralidad de Nanotubos mediante la Función de Distribución Radial (RDF) y Algoritmo de Crecimiento para Fullerenos". Thesis written in English. Termination April 2005.
6. **Daniel Ramírez González. (B.Sc by thesis, IPICYT, México)** Title: "Novel Properties of Ferromagnetic Nanowires: Theory and Experiment". Received degree Nov. 2002.
10. **Federico Villalpando Páez (B.Sc. Universidad Iberoamericana, México).** Title: "Carbon Nanotubes: Theory and Experiment". Degree Received August 2003.
11. **Mariela Bravo Sánchez. (B.Sc by thesis, IPICYT, México)** Title: "Electronic Properties of Non-classical Fullerenes using Hueckel Approximations". Degree to be received in December 2003.
12. **Giles Middleton (B.Sc. (project student), University of Sussex, UK).** Title: "Production and purification of carbon nanotubes and metal nanowires". Received degree Jul. 1999.
13. **Ciaran Cahil (B.Sc. (project student), University of Sussex, UK).** Title: "Generation of aligned nanotube films via self-assembly processes". Received degree Jun. 1999.
14. **Carmen Piehl (B.Sc. (project student), University of Sussex, UK).** Title: "Carbon Nanotubes". Received degree Jul. 1995.
15. **Henrik Pettersson. (B.Sc. (project student), University of Sussex, UK).** Title: "Controlled Production and Characterisation of Metal nanowires". July 2001.

#### **PhD Students (In progress)**

16. **Eduardo Cruz Silva. (Ph.D. IPICYT, México).** Title: "Síntesis, Caracterización y Propiedades Físicas de Nanoestructuras Dopadas". Termination July 2007.
17. **José Manuel Romo Herrera (Ph.D. IPICYT, México)** Title: "Jerarquía en Nanoestructuras de Carbono". Termination July 2007.
18. **Leonardo Chávez Guerrero. (Ph.D. IPICYT, México).** Title: "Propiedades Físicoquímicas de los Materiales Mesoporosos". Termination July 2007.
19. **Mariamne deHonor Gómez. (Ph.D. IPICYT, México).** Title: "Propiedades morfológicas y electrónicas de copolímeros bloque PE O-b-PS dopados con nanotubos de carbono". Termination July 2007.

20. **David Meneses Rodríguez (Ph.D. IPICYT, México).** Title: "Fabricación y caracterización de una celda espintrónica". Termination July 2007.
21. **Abraham Cano Márquez (PhD. IPICYT, México).** Title: "Modificación de nanotubos de carbono con polímeros conductores electrónicos para la síntesis y caracterización de nanocompuestos". Termination January 2010.
22. **Jessica Campos Delgado (PhD. IPICYT, México).** Title: "Dopaje de SWNTs con distintas especies atómicas: desde síntesis y caracterización hasta su biocompatibilidad". Termination January 2010.
23. **Aaron Morelos Gómez (PhD. IPICYT, México).** Title: "Auto-Ensamblaje aplicado en cristales líquidos y ópalo inverso de carbono". Termination January 2010.
24. **Andrés Botello Méndez (PhD. IPICYT, México).** Title: "Síntesis y propiedades de nuevas nanoestructuras de óxido de Zinc". Termination January 2010.

#### **EXPERIMENTAL EXPERTISE**

- Arc Discharge generator for fullerene and nanotube production.
- Pyrolytic methods for aligned nanotubes production.
- Electrolytic techniques for the generation of carbon nanotubes, encapsulated materials and metal nanowires.
- X-ray diffractometer (Siemens D-5000 CuK $\alpha$ ).
- Transmission Electron Microscopes (JEOL 4000-EX, JEOL ARM 1250, Hitachi 7100, JEM 100CX, JEM 2000 Fx).
- Scanning Electron Microscope (Leo 5420 SEM).
- Nd:YAG Laser.
- SQUID Magnetometry (Quantum Design MPMS magnetometer).
- Conductivity Measurements (Four and two probe method, Oxford Instruments).
- Thermogravimetric Analysis (Perkin-Elmer 7 Thermogravimetric Analyzer).
- ESR measurements (Bruker ESP 300 spectrometer).

#### **COMPUTATIONAL EXPERTISE**

- Molecular Simulations using force field techniques and empirical interatomic potentials.
- Cache-Molecular Simulations.
- Data Structural Refinement (PROFIL 5.12 and REFCEL).

#### **IV. HONOURS AND AWARDS**

- |                         |  |
|-------------------------|--|
| April 2007              | "Fernando Alba" Medal, awarded by UNAM (Mexico) for outstanding contributions in experimental Physics.   |
| Sept. 2006              | "Elected TWAS Fellow." The Academy of Sciences of the Developing World for his outstanding scientific contributions in nanoscience and nanotechnology.   |
| Dec. 2005               | "TWAS Prize in Engineering Science." Awarded by the Academy of Sciences of the Developing World for outstanding scientific contributions in the synthesis and characterization of doped nanotube structures. Brazil. <i>Note: The youngest Scientist to receive a TWAS award ever.</i> |
| May 2005                | "José Antonio Villaseñor y Sánchez" Prize for his outstanding scientific contributions in the state of San Luis Potosí. Awarded by the State of San Luis Potosí.   |
| Jul. 2005-<br>Jun. 2010 | National Researcher level III (Investigador del Sistema Nacional de Investigadores Nivel III). Level III is the TOP LEVEL  |

- April 2004 Invited Profesor, Université Catholique de Louvain La Neuve & Namur University (Belgium). April-June 2004.
- April 2004 Mexican Achiever Prize in Science and Technology by the Journals "Expansión" and "Vuelo" (Mexico).
- March 2004 Cover Winner of the Year 2003 for the Journal *Advanced Materials*. The cover was published in November 2003 together with one of our papers.
- Jan. 2004 Visiting Director of the International Center for Young Scientists (ICYS) at the National Institute of Materials Science (NIMS), Japan.
- Dec. 2003 Member of the Evaluation for Board for Nacional Projects in Engineering CONACYT. Usually more than 500 projects per year have to reviewed and discussed for funding. (Dec. 2003 – Dec. 2006)
- Nov. 2003 "El Potosi" International prize for contributions in nanoscience and Nanotechnology of Carbon. Award given to the most outstanding scientist at IPICYT.
- May. 2002 "Revista DIA SIETE". Considered as the 113 Young Mexicans with present and Future.
- Jun. 2002 "Revista EXPANSION". Considered as the 30 promeses in Mexico at ages between 30-40 years old. For numerous contributions in nanotechnology.
- Oct. 2001 UNESCO, Javed Husain Prize for Young Scientists for contributions in nanotechnology of carbon and other layered materials.
- Dec. 2001 Fellow of the Mexican Academy of Sciences.
- Oct. 2001 Member of the Advisory Board of the International Journal CARBON (Elsevier Science, The Netherlands)
- Sept. 2001 National Prize for Chemistry 2000, for contributions in Nanotechnology of layered materials.
- Jun. 2000 Conference Fellowship. NATO Advanced Study Institute (ASI) award for attending: Carbon Filaments and Nnaotubes: Common Origins, Diferring Applications. Budapest, Hungary 19-30 June 2000.
- Oct. 1999-  
Dec. 2000 Alexander von Humboldt Fellowship tenable at the Max Planck Institut für Metallforschung (Stuttgart). Research Programme entitled: "Structural and dynamic behaviour of metals encapsulated in nested fullerenes and nanotubes".
- Jul. 1999-  
Jun. 2002 National Researcher level II (Investigador del Sistema Nacional de Investigadores Nivel II
- Mar. 1999-  
Mar. 2001 Programa de Primas al Desempeño y Productividad del Personal Académico de la Mar. 2001 UNAM (PRIDE) Nivel C.
- April 1999 Conference Fellowship "Engineering Foundation" to attend Nanocomposite Materials: Design and Applications" (Anchorage, Alaska, 28 March- 2 April, 1999)

- Jan. 1999-present Royal Society Research Fellowship at the University of Sussex. Research Programme entitled: "Novel graphite-like structures" under the supervision of H. W. Kroto (FRS).
- May 1998 Conference Fellowship. NATO Advanced Study Institute (ASI) award for attending: Design and Control of Structure of Advanced Carbon Materials for Enhanced Performance. Antalya, Turkey 9<sup>th</sup>-21<sup>st</sup> May 1998.
- Nov 1997-Jan. 1998 Research Fellowship sponsored by the University of California (Santa Barbara) and the Royal Society of Great Britain.
- Feb. 1998 Short stay as visiting Research Fellow at the Max Planck Institut für Metallforschung/ Professor's Rühle Group (Stuttgart, Germany 22-29 February, 1998).
- Jan 1997-Oct 1997 Research Fellowship at the Fullerene Science Centre (University of Sussex) sponsored by British Oxygen Company (BOC Gases)
- Dec. 1996-Aug. 1995 Academic Scholarship, ORS (Overseas Research Scholarship), Committee of vice-chancellors and Principals of the Universities of the United Kingdom (Tuition and Registration fees).
- Dec. 1996-Jan. 1994 Academic Scholarship, Mexican National Council for Science and Technology (full scholarship for Doctoral studies).
- Jul. 1993 Fulbright Fellowship for doctoral studies by the US Government to study at Rice University, Houston (Award not taken)
- Nov. 1992 The Best Student of Mexico Award, Mexican National Council for Science and Technology.
- Nov. 1992 Excellent Performance Awards in Oral Thesis Defence, Universidad Iberoamericana.
- Jan. 1992 Highest Grade Point Average Award, Universidad Iberoamericana.
- Jan. 1992-Aug. 1987 Academic Scholarship, Secretariat of Public Education (Tuition and Registration waiver for undergraduate studies).

## V. GRANTS AND PROJECTS

### As Principal Investigator

- Dic. 2006 \$4,000,000 (USD), awarded by CONACYT (Mexico) and the State of San Luis Potosí (Mexico). Grant entitled: "National Nanoscience and Nanotechnology Research Laboratory". Principal Investigator: Mauricio Terrones. Grant for acquiring state of the Nanotechnology equipment and the establishment of the first National Laboratory in Nanoscience and Nanotechnology in Mexico.
- Nov. 2006 \$26,000 (USD), awarded by CONACYT (Mexico) and the DAAD (Germany). Grant for 2 years, entitled: "Carbon Nanotubes with metal cores: Synthesis and Electron Microscopy Experiments". Principal Investigators: Mauricio Terrones and Florian Banhart.
- August. 2005 \$10,000 (USD), awarded by CONACYT (Mexico) and the University of

Texas in Austin. Grant for 1 year, entitled: "Magnetic Properties of Alloyed Nanowires inside Carbon Nanotubes: Theory and Experiment". Principal Investigators: Mauricio Terrones and Alex de Lozanne.

- June. 2005     \$31,000 (USD), awarded by CONACYT (Mexico) and the Fondo Mixto de Puebla. Grant for 2 years, entitled: " Fabricacion y caracterizacion de nanotubos de carbono dopados con fosforo y silicio". Responsable: Mauricio Terrones.
- June. 2005     \$170,000 (USD), awarded by CONACYT (Mexico) as an individual researcher project. Grant for 3 years, entitled: " Sintesis Masiva y Caracterizacion de Nanoalambres de Aleaciones Ferromagneticas para la fabricacion de nuevos Nanocompuestos Poliméricos". Responsable: Mauricio Terrones.
- Apr. 2005       \$20,000 (USD) awarded by the MIT-CONACYT consortium. Project for 2 years entitled: "Doping Single- and Double-wall Carbon Nanotubes with B or N: Experiment and Theory". Principal Investigators: Mauricio Terrones y Mildred S. Dresselhaus.
- Jan. 2005       \$130,000 (USD) awarded by CONACYT (Mexico) to the Secretariat of Health. Grant for 3 years, entitled: " NANOCIENCIA EN SALUD: PRODUCCION CONTROLADA DE NANOTUBOS DE CARBONO DOPADOS CON NITROGENO PARA LA FABRICACION DE SENSORES DE SOLVENTES CANCERIGENOS Y GASES TOXICOS". Primary Investigator: Mauricio Terrones.
- Nov. 2003       \$25,000 (USD), awarded by CONACYT (Mexico) within the PCP program, to support research of PhD. Student Benjamín Fragneud. Grant for 3 years, entitled: " Modificación de la Interface de Nanotbos de Carbono para dispersarlos en una matriz de polibutadieno". Co'applicants: Alfonso González Montiel and Jean Yves Cavllie (CNRS –Lyon, France).
- Oct. 2003       \$25,000 (USD), awarded by CONACYT (Mexico) within the PCP program, to support research of PhD. Student Marianne DeHonor. Grant for 3 years, entitled: " Propiedades Morfológicas y Electrónicas de Copolimeros Bloque PE-Ob-PS dopados con nanotubos de carbono". Co-applicants: Alfonso González Montiel and Jean Yves Cavllie (CNRS –Lyon, France)
- Jun. 2002       \$160,000 (USD), awarded by CONACYT (Mexico) and NSF (USA) within the CIAM framework. Grant for 3 years, entitled: "Inter-American Materials Collaboration: Large scale synthesis of N-doped carbon nanotubes for the fabrication of novel polymer composites and related low dimensional materials". USA co-applicant: Prof. P.M. Ajayan.
- Jul. 2002       \$24,181.64 (USD), awarded by University of California-MEXUS and CONACYT (Mexico). Grant for 2 years, entitled: " Ferromagnetic Nanowires: Controlled Production, Characterisation and Theoretical Studies". UCSB Co-applicant: Prof. Anthony K. Cheetham.
- Mar. 2002       £152,041 awarded by the EPSRC (Great Britain). Grant for 3 years, entitled: "Carbon Based Electronics: A National Consortium". Sussex Co-applicants: Prof. Harold. W. Kroto and Dr. D. R. M. Walton. This network awarded a total of ca. £2,000,000 among various universities such as Cambridge, Oxford, UCL, Liverpool, etc.
- Jan. 2002       \$130,000 (USD), awarded by CONACYT (Mexico). Grant for three years.

Project entitled: "Controlled Production and electronic properties of novel layered nanomaterials".

Nov. 1999 \$124,979 (USD) awarded from CONACYT (Mexico). Grant for 3 years, entitled: "Produccion controlada y estudio teorico de nuevos materiales nanoestructurados". Co-applicants: Dr. Humberto Terrones and Dr. Jose Luis Aragon Vera.

#### **As Co-principal Investigator**

Apr. 2001 £1,865,698 awarded as an European Network (Fifth Network Programme: Competitive and Sustainable Growth -Thematic Network). Grant for 4 years entitled: "Carbon Nanotubes for Future Industrial Composites: theoretical potential versus immediate applications". The network involves 13 partners from European Countries. Project responsible (Prof. Karl Schulte, Germany).

Apr. 2001 £54,000 awarded by the EPSRC (Great Britain). Grant for 1 year (postdoctoral researcher), entitled: "Analysis and Detection of Emission during Phase Transitions -ADEPT". Co-applicant: Prof. Peter Twonson.

Nov. 2000 \$1,000,000 (USD) awarded by CONACYT (Mexico) and the World Bank (millennium initiative). Grant for three years (equipment, travel and subsistence), Project entitled: "Physicochemical Studies of Novel Nanostructured Materials" Co-applicants: Dr. Jose Luis Moran-Lopez, Dr. Humberto Terrones, Dr. Jesus Dorantes-Davila and Dr. Roberto Escudero.

#### **Projects with Industry and Agreements with Research Institutions**

1. Sept. 2004. Collaboration Agreement between the National Institute of Materials Science (NIMS) and IPICYT: September 2004, Dr. M. Watanabe (NIMS) and Dr. Bando (director of ICYS) signed a Memorandum of Understanding (MOU) with IPICYT.

2. 2003-present. Confidential Project with Hitachi Research Laboratory (Japan).

3. 2003 – present. Confidential Project with JUMEX (Mexico). Three patents pending.

4. 2005 – present. Confidential Project with MABE (Mexico). Applications of Carbon Nanotubes

5. 2005 – present. Confidential Project with CONDUMEX (Mexico). New materials in Communication Technologies.

7. 2005 – present. Confidential Project with Peñoles (Mexico). Production of New Nanomaterials of Ag and Bi for various applications.

#### **VI. OTHER ACTIVITIES**

Aug. 2005 Co-Chairman of the Symposium No. 20 (Interamerican Collaboration in Materials), held in Cancun (México) from August 21-25, 2005. As a part of the XIV International Materials Research Congress.

April 2005 Co-Chairman of Symposium on "Science and Applications of Carbon Nanotubes" at the Materials Research Society Spring Meeting (San

Francisco, CA; March 28 – April. 1, 2005).

- Nov. 2004 Co-Chairman of Symposium on "Mesoscale Architectures from Nano-Units — Assembly, Fabrication, and Properties" at the Materials Research Society Fall Meeting (Boston, MA; Nov 29 – Dec. 3, 2004).
- Jul. 2004 Chairman of the 5<sup>th</sup> International Conference on Carbon Nanotubes and Applications NANOTUBE 04, in San Luis Potosí, México (19-24 July 2004). Attended ca. 300 participants from 30 different countries.
- May. 2004 Co-organiser of the workshop entitled "Towards a National Initiative: Nanostructured Materials", IPICYT, México. May 2004 (sponsored by CONACYT-México).
- May. 2003 Co-organiser of the workshop entitled "Towards a National Initiative: Nanostructured Materials", IPICYT, México. May 20-22, 2003 (sponsored by CONACYT-México).
- May. 2002 Co-organiser of the workshop entitled "Towards a National Initiative: Nanostructured Materials", IPICYT, México. May 15 - 17 (sponsored by CONACYT-México).
- Aug. 2001 Co-organiser of: "Nanotechnology in Carbon and Related Materials", University of Sussex, August 29 – September 1, 2001 (sponsored by the Institute of Physics, Society of Chemical Industry and the Royal Society of Chemistry).
- Sept. 1999 Co-organiser of: "Nanotechnology in Carbon and Related Materials", University of Sussex, Sept. 8-10, 1999 (sponsored by the Institute of Physics, Digital Instruments, Society of Chemical Industry and the Royal Society of Chemistry).
- Sept. 1998 Co-organiser of: "Nanotechnology in Carbon and Related Materials", University of Sussex, Sept. 9-11, 1998 (sponsored by the Institute of Physics, Society of Chemical Industry and the Royal Society of Chemistry).
- Apr. 1998 Committee member of the British Carbon Group
- Mar. 2000
- Jan 1996 Founder and member of the Mexican Society for Crystallography
- present
- May 1995- Member of the Electrochemical Society.
- 1999
- May 1991- Student member of the Department of Physics Technical Committee, May
- 1989 Universidad Iberoamericana.

## VII. ORAL PRESENTATIONS

- Oct. 2005 "Nanociencia n Nanotecnología del Carbono". Invited Talk. Chemical Engineering Seminar. Tecnológico de Aguascalientes, Mexico (Oct. 21)
- Sept. 2005 "Dopaje en Nanotubos de Carbono". Plenary Talk. XXV Conferencia on Surface Science. Zacatecas, Mexico Sept. 25-30, 2005



- Sept. 2005 "Doped Nanotubes: Tpxicity and Novel Applivations". Invited Talk. Prof. Morinobu Endo, Japan (Sept. 14).
- Sept. 2005 "The importance of Doping in Nanotube Applications", invited by Dr. K. Hidaka Hitachi, Japan (Sept. 19).
- Sept. 2005 "Nuevos Horixontes en la Ciencia: Nanotecnología, Qué es?", Plenary talk. XXXIII congreso nacional de Ginecología y Obstetricia de la asociación guatemalteca de la especialidad – AGOG. Guatemala, Guatemala (5-9 September, 2005)..
- Aug. 2005 "Developing Doped and Defective Nanotubes for Emerging Technologies", invited talk. Symposium No. 20 (Interamerican Collaboration in Materials), which will be held in Cancun (México) from August 21-25, 2005. As a part of the XIV International Materials Research Congress.
- June. 2005 "Nanotube Science and Technology: Present and Future", invited by Prof. Malcolm Green and the Mexican Student Society at Oxford University (Oxford University, UK).
- June. 2005 "Nuevos Horizontes en Nanociencia y Nanotecnología", invited by the Institute of Economics Research, UNAM (Mexico). Invited.
- May. 2005 "Nanotecnología", invited by the Center of Reserach on Industrial Design UNAM (Mexico). Invited.
- Apr. 2005 "Defect Engineering: The importance of Defects in Carbon Nanostructures", invitado por el Prof. V.M. Krenke, Director of the Consortium of the Americas for Interdisciplinary Science. University of New Mexico, USA. Invited.
- Apr. 2005 "Latest Advances and Future Challenges of Nanotube Science and Technology", invitado por el Dr. Alan Hurd, director del Manuel Lujan Jr. Neutron Scattering Center, Los Alamos National Laboratory, USA. Invited.
- Apr. 2005 "Nanociencias un Campo Intrisicamente Multidisciplinar", Posgraduate Seminar at IPICYT (April, 28).
- Apr. 2005 "Nanociencias un Campo Intrisicamente Multidisciplinar". Invitado. Instituto Tecnológico de San Luis Potosí (Abril, 29).
- Mar. 2005 "Defect Nanotube Engineering: An Alternative to Novel Devices". Invited Talk. Nanocarbons Netwrok and invited by Prof. Morinobu Endo. Tokyo, Japan (March)..
- Mar. 2005 "Defect Engineering: The importance of Defects in Carbon Nanostructures", invited by por el Dr. Kishio Hidaka de la Empresa Hitachi, Japón (Marzo 25).
- Mar. 2005 "The Importance of Defects in Carbon Nanostructures: Novel Properties and Materials", invited by Prof. Yoshio Bando (director del ICYS). ICYS-NIMS, Japón (Marzo 11).

- Mar. 2005 "The Importance of Defects in Carbon materials", Invited by Prof. T. Enoki, Tokyo Institute of Technology (TIT), Tokyo, Japan (March 15).
- Feb. 2005 "Advances and Challenges of Carbon Nanotube Science and Technology: The Importance of Doping". Invited talk. Nanoscience for Advanced Applications: on Crossroads of Disciplines, US-Mexico Workshop Guanajuato, Mexico (16-19 February, 2005).Ensenada-México. Enero 17, 2005. Invited.
- Feb. 2005 "La Nanociencia y Nanotecnología del Carbono en México: Un mito o una Realidad ". VII International Symposium of Physics: Beyond the Unknown, Organizado por la Sociedad de Alumnos de Ingeniería Física Industrial (SAIFI) del ITESM (Monterrey, N.L. 17, 18, 19 February 2005) Plenary Talk.
- Jan. 2005 "El impacto de la Nanotecnología en el Desarrollo Científico y Tecnológico de México". Invited by Dr. Arturo Serrano, Cicese, Ensenada-México. January 17, 2005. Invited.
- Dec. 2004 "Layared Nanomaterials: Curved & Doped Nanotubes, Networks and Other Forms of Carbon". Invited by Dr. Laure Bourgois, Monash University, Australia; December 2, 2004. Invited.
- Nov. 2004 "Doped and Defective Carbon Nanostructures: Novel Functional Materials for Future Applications". Invited Talk. 3<sup>rd</sup> International Conference on Advanced Materials Processing (ICAMP3), Melbourne, Australia, Nov. 29 – Dec. 1. Invited.
- Nov. 2004 "Layared Nanomaterials: Doped Nanotubes, Networks and Other Forms of Carbon". Invited by Professor Gordon Wallace, Wollongong University, Australia; November 13, 2004. Invited.
- Nov. 2004 "Building Novel Functional Nano-Materials: Doped and Defective Carbon Nanotubes". Invited Talk. 2<sup>nd</sup> Nanocarbons Meeting; Nagano - November 15 - 18, 2004. Invited.
- Nov. 2004 "La importancia del Dopaje en Aplicaciones de los nanotubos de Carbono". Invited. Congreso Internacional en Ciencia e Ingeniería de Materiales, Querétaro, México; Nov. 8 -12, 2004.
- Oct. 2004 "La Historia de la Nanotecnología y sus Alcances". Invited during a workshop on Science Press, Week os Science and Technology in Mexico; Oct. 25 – 29, 2004, Monterrey, Mexico. Invited.
- Oct. 2004 "Nanotecnología en el IPICYT". Invited during the Week os Science and Technology in Mexico; Oct. 25 – 29, 2004, Monterrey, Mexico. Invited.
- Sept. 2004 "Advances and Challenges of Heteroatomic Nanotube Science and Technology". Invited Plenary Talk. During the 2nd Mexican Meeting on Mathematical and Experimental Physics; El Colegio Nacional Sep. 6 – 10, 2004. Plenary Talk.
- Oct. 2004 "New Directions in Carbon Nanotube Science: Controlled Synthesis, Electronic Properties and Novel Devices using B- and N-doped systems: nanotubes, doping, applications". Invited Talk. III Meeting of the Brazilian

- Society for Materials Research, October 10 - 13, 2004; Foz de Iguaçu, Brazil. Invited.
- Oct. 2004 "New Directions of Carbon Nanotube Science: Importance of Defects and Doping". Plenary Talk. Nanotec 2004, Batz-sur-Mer, France Oct. 10-15, 2004. Plenary.
- July 2004 "Nanociencia y Nanotecnología del Carbono: Teoría, Síntesis, Caracterización y Aplicaciones". Invited by Prof. Miguel Angel Vidal; ICO, Universidad Autonoma de San Luis Potosí, San Luis Potosí, México. Invited.
- June 2004 "Perspectives of Science in Mexico". Invited by the Association of Mexican Students at Cambridge University, UK.
- June 2004 "Carbon Related Nanomaterials: Controlled Synthesis, Electronic Properties and Novel Devices". Invited by Dr. Andrea Ferrari and Prof. W.I. Milne. Cambridge University, UK. Invited.
- Mayo 2004 "Layered Nanomaterials: Doped Nanotubes, Networks and Other Forms of Carbon". Invited Talk, Physics Department, Namur University (Mayo 25 - Mayo 26, 2004). Invited.
- Mayo 2004 "Defect Engineering and the Role of Defects: The Formation of Novel Carbon Structures with Novel Properties". Invited talk during the Belgian Physical Society Meeting, Mons, Belgium (25-26 de Mayo, 2004). Invited.
- Mayo 2004 "Latest Advances and Future Challenges of Carbon Nanotube Science and Technology". Plenary Talk during the XXVII Encontro Nacional de Física da Matéria Condensada, Poços de Caldas, Brasil (May 4 - 8, 2004).
- Abril 2004 "Advances and Challenges of Carbon Nanotube Science and Technology". Invited talk during the workshop entitled "Frontiers of Materials Research: A CIAM, CIMAT - CONICYT WORKSHOP, Viña del Mar, Chile (Abril 25 - Abril 29, 2004). Invited
- Mar. 2004 "Novel Carbon Nanotube Composites: 2D Networks and SiO<sub>x</sub>-tube Materials". Nanocarbons Workshop, invited by Prof. Morinobu Endo; Tokyo, Japan.
- Mar. 2004 "Polymerization and Fusion of Carbon Nanopepods: A Route to Novel One-dimensional Materials", Invited talk within the Conference *Particles 2004*, Orlando, Florida (USA); March 6-10, 2004.
- Mar. 2004 "Advanced Layered Nanomaterials: Doped Nanotubes, Networks and Other Forms of Novel Carbon", invited by Prof. Yoshio Bando (director Of ICYS). ICYS-NIMS, Japan.
- Mar. 2004 "Doped Carbon Nanotubes as new components of Nanotechnology Devices", invited by Dr. Kishio Hidaka; Hitachi, Japan.
- Feb. 2004 "Creation of Novel Composites with Carbon Nanotubes: Recent Advances and Challenges", invited by Prof. Morinobu Endo. Shinshu University, Japan.
- Feb. 2004 "Doped Nanotubes, 2D networks and Other Novel Forms of Nano-scale

Carbon", invited by Prof. Riichiro Saito. Tohoku University, Japan:

- Feb. 2004 "Doped Nanotubes, 2D Networks and Other Novel Forms of Nano-scale Carbon", invited by Prof. Sumio Iijima & Dr. Masako Yudasaka NEC, Japan.
- Nov. 2003 "Nanociencia y Nanotecnología en México: Síntesis y Caracterización de Nuevas Estructuras". Presented in the National Meeting of Crystallography (Morelia, Michoacán). (Plenary Talk).
- Nov. 2003 "Juguemos con Átomos y moléculas y Hagamos Nuevos Materiales". Presented in the Secretariat of Education of the State of Coahuila (Saltillo, Coahuila) under the 10<sup>th</sup> week of Science and Technology. (Invited Talk, 2 November).
- Oct. 2003 "Síntesis de Nanoestructuras Laminares y sus Aplicaciones". Presented in the Chemistry Seminar, Universidad Autónoma de San Luis Potosí. (Invited Talk, 7 October).
- Sept. 2003 "Materiales Avanzados". Presented in the Secretariat of Education of the State of Puebla (Puebla, Puebla) under the First Meeting on Nanoscience and Nanotechnology. (Invited Talk, 25 September).
- Sept. 2003 "La Nanociencia del Carbono: teoría, Síntesis y Caracterización". Presented in Center for Physics, UNAM (Cuernavaca, Morelos) the Science Museum, México City (UNIVERSUM). (Invited Talk, 24 September).
- Sept. 2003 "Juguemos con Átomos y Hagamos Nuevos Materiales: Desarrollo de la Nanotecnología". Presented in the Science Museum, México City (UNIVERSUM). (Invited Talk, 23 September).
- Aug. 2003 "Synthesis of Novel Layered Nanostructures and the Creation of 2D and 3D Carbon Nanotube Networks". Presented in The II Applied Statistical Physics: Molecular Engineering Conference (ASTATPHYS-MEX-2003). (Invited Talk).
- Aug. 2003 "Advanced Nanomaterials: Doped Nanotubes, Networks and Other Novel Forms of Carbon". Presented at the Max-Planck Institut für Metaforschung (Stuttgart, Germany, 22 August 2003). (Invited Scientist).
- Aug. 2003 "Building the Carbon Nanocosmos". Present at the Center for Solid State Science Arizona State University, USA. (15 August, 2003). (Invited Talk).
- Aug. 2003 "In-situ welding of Single-walled carbon nanotubes and melting of encapsulated metal clusters". Presented at the Microscopy and Microanalysis Meeting, San Antonio, TX -USA (3-7 August). (Invited Speaker).
- Jul. 2003 "Materiales Laminados". Presented at the Material Science Course for Postgraduate Students. Universidad de Concepción (Chile). (Invited Lecturer).
- Jul. 2003 "Layered Nanomaterials: Controlled Synthesis, Theoretical Studies and Applications". Presented at The International Conference on the Science and Application of Nanotubes NANOTUBE 03. Held in Seoul Korea (7-11 July 2003). (Invited Speaker).

- Jun. 2003 "Building Carbon Nanodevices". Presented the Symposium of Modern Physisc in Honour of Sir Roger Elliot, Instituto de Física UNAM (México, DF; 17-19 Jun 2003). (Invited Talk).
- Jun. 2003 "Layered Nanomaterials: Controlled Synthesis, Theoretical Studies and Electronic Properties". Presented in the Pan American Advanced Study Institute on Physics at the Nanometer Scale (Bariloche, Argentina, 8-18 June 2003). (Invited Speaker).
- May 2003 "Exploring the Carbon Nanocosmos: Doped Nanotubes, Networks and Other Forms of Carbon". Presented at the SPIE meeting on Microelectrnics for the new Millennium 2003 (Maspalomas, Canary Islands, 19-21 May 2003). (Keynote Lecture).
- May 2003 "Building Novel Carbon Nanostructures in the Electron Microscope". Presented in the Second Mexican workshop on Nanoscience and Nanotechnology (15-17 May, 2003), held at IPICYT (México). (Invited Talk).
- May 2003 "Novel Carbon-Carbon Nanocomposites: Building 2D and 3D single-walled nanotube networks". Presented in the Electrochemical Society Meeting, Paris (May 2003). (Invited Talk).
- Nov. 2002 "Nanotecnología del Carbono y sus Aplicaciones en el Siglo XXI". Presented at the XXIV Congreso Internacional de Metalurgia y Materiales. Instituto Tecnológico de Saltillo.(November 8th, 2002) (Invited Talk).
- Nov. 2002 "Nuevas Nanoestructuras Laminadas: Producción Controlada, Caracterización y Nuevas Tecnologías" Presented at the XXXIV Congreso de Ingeniería y Ciencia de Materiales, Tecnológico de Querétaro (November 7th, 2002) Querétaro, Qro., Mexico. (Invited Talk).
- Oct. 2002 "Nuevas Nanoestructuras Laminadas: Producción Controlada, Caracterización y Nuevas Tecnologías", Presented at the Facultad de Ingeniería Mecánica y Eléctrica, Universidad Autónoma de Nuevo León (October 24th, 2002). (Invited Talk).
- Oct. 2002 "Nanotecnología del Carbono". Presented at the Engineering Institute, UNAM, Mexico City. (October 14<sup>th</sup>, 2002) (Invited Talk).
- Sept. 2002 "Nanotecnología en América Latina: un mito o una realidad". Presented at the Segunda Semana de las Ingenierías, Universidad Iberoamericana, Mexico City.(September 30th, 2002). (Inaugural conference).
- Sept 2002 "Novel Advances in the Synthesis and Applications of Doped Carbon Nanotubes" Presented at Hitachi Company (24 September 2003).
- Sept 2002 "Connecting Carbon Nanotubes" Presented at the Second International Workshop on Quantum Nonplanar Nanostructures and Nanoelectronics 02" (8 –11 September 2003).
- Sept. 2002 "Novel Carbon-Carbon Nanotube Composites: 2D and 3D Tube Networks". Presented in Carbon 2002, Beijing (15-20 September, 2002).
- Aug. 2002 "La nanotecnología del Carbono". Presented at IPICYT, San Luis Potosí, S : L. P. (Invited Talk).

- Aug. 2002 "Towards nano-device fabrication: joining and connecting single-walled carbon nanotubes". Presented in Nanotec 02, University of Sussex, UK. (28-31 August, 2002). Invited Talk.
- Jul. 2002 "Boron-, Nitrogen- and Iron-doped Carbon Nanomaterials: Controlled Synthesis, Electronic Properties and Novel Molecular Devices". Presented in Nanotube 02, Boston, USA. (6-11 July 2002). Invited Talk.
- Jun. 2002 "Nanotubes: Synthesis and Electronic Properties". Presented at Shinshu University, Japón. (June 2002). Invited Talk.
- May. 2002 "Synthesis of Novel Layered Nanostructures and the Creation of 2D and 3D Carbon Nanotube Networks". Presented at the Institute of Materials, CSIC-Barcelona, Spain. Invited Talk.
- April. 2002 "Layered Nanomaterials: Controlled Synthesis, Theoretical Studies and Electronic Properties". Presented at the Rensselaer Polytechnic Institute, USA. Invited Talk.
- Feb. 2002 "Making Carbon Nanotube Junctions: Fabrication and Electronic Properties". Presented in Shinshu University, Nagano, Japan. Invited Talk.
- Feb. 2002 "Exploring the Carbon Nanocosmos: Doped Nanotubes, Networks and Other Novel Forms of Carbon". Presented in University of Louvain La Neuve, Belgium. Invited Talk.
- Feb. 2002 "Carbon Related Nanomaterials: Controlled Synthesis, Electronic Properties and Novel Devices". Presented at the Materials Department, University of Leeds, UK. Invited Talk.
- Feb. 2002 "Novel Carbon Nanotube Composites: Networks and SO<sub>x</sub>-tube materials". Presented at the CNT European Network meeting, Lyon France (27 February – 1 March). Invited Talk.
- Nov. 2001 "Explorando el Nanocosmos: Producción y Aplicaciones de Nanotubos de Carbono". Presented at the First Anniversary of IPICYT. San Luis Potosí, México (24 November 2001). Plenary Talk.
- Nov. 2001 Nanoestructuras de Carbono: Síntesis Controlada, Propiedades Físicoquímicas y Aplicaciones". Presented at the weekly seminar series of the Chemistry Department. Universidad Autónoma de San Luis Potosí. San Luis Potosí, México (28 November 2001). Invited Talk.
- Nov. 2001 "Novel doped and undoped Nanocarbons: The development of emerging technologies". To be presented at Nanocarbons, Nagano, Japón (Nov. 11-16, 2001) Invited.
- Sep. 2001 "Carbon related nanomaterials: Controlled synthesis, electronic properties and applications". To be presented at NANOCOMP-workshop: "Nanotubes: Production, Characterization and Application". Zaragoza España (10 September 2001). Invited.
- Jul. 2001 "Novel layered nanomaterials: Controlled synthesis, electronic properties and applications". To be presented at International Workshop on the Science and Application of Nanotubes, Potsdam, Germany (July 22-25, 2001) Invited.

- Jul. 2001 "Connecting and Joining Carbon Nanotubes". To be presented at the American Carbon Society CARBON 2001 Conference. Lexington, Kentucky USA (July 14-19, 2001).
- Mar. 2001 "Advances on the growth and properties of n and b-doped carbon nanotubes". Presented at Euroconference on Electronic Properties of Novel Materials; Kirchberg / Tirol Austria International Winterschool on Electronic Properties of Novel Materials IWEPM 2001 (3-10 March, 2001). Invited.
- Nov. 2000 "Electronic Properties of Carbon Nanotubes". Presented at Sinshu University, Nagano, Japan. Invited.
- Sep. 2000 "Controlled Synthesis of Carbon Nanostructures" (invited). Presented at Nanotubes and Nanostructures 2000, Sardegna, Italy (24-30 Sept. 2000).
- July 2000 "Efficient Routes to Large Arrays of  $CN_x$  Nanofibres". Presented at EUROCARBON 2000, Berlin, Germany (9-13 July 2000).
- June 2000 "Controlled Synthesis of Tubular Carbon and  $B_xC_yN_z$  Architectures" (invited). Presented at the Advanced Study Institute (ASI): Carbon Filaments and Nanotubes: Common Origins, Differing Applications. Budapest, Hungary 19-30 June 2000.
- June 2000 "Controlled Fabrications of  $CN_x$  Nanostructures" (invited). Presented at TRANSDIAM, Amiens, France (5-8 June 2000).
- May 2000 "Structure, Synthesis and Applications of Novel Carbon Nanostructures" (invited). Presented at EPSRC meeting for Carbon Based Electronics (London, May 31).
- May 2000 "Defects in Carbon Nanotubes" (invited). Presented at the Indian Institute of Science, Bangalore, India.
- May 2000 "Synthesis and properties of dichalcogenide Nanotubes" (invited). Presented at General Electric India Technology Centre, Bangalore, India.
- Jan. 2000 "New Metallic Allotropes of Carbon". (invited) Presented at the National Institute for Research in Inorganic Materials (NIRIM), Tsukuba, Japan
- Jan. 2000 "Novel advances in the creation of Nanostructures". (invited) Presented at the National Institute of Materials and Chemical Research (NIMC), Tsukuba, Japan
- Jan. 2000 "Novel Advances in the Creation of Metal-filled Nanotubes". (invited). Presented in Shinshu University, Nagano, Japan.
- March 1999 "Self Assembly generation of Novel Nanocomposites". Presented in: Nanocomposite Materials: Design and Applications (Anchorage, Alaska, 28 March- 2 April, 1999). Invited speaker.
- Feb. 1999 "Novel Advances in the Creation of layered  $C_xN_y$  and  $B_xC_yN_z$  Nanostructures by Self Assembly Processes". Presented at the Materials Research Laboratory, University of California at Santa Barbara, USA. Invited speaker.

- Sept. 1998 "BN, BCN and CN nanotubes with interesting morphologies". Presented in: "Nanotechnology in Carbon and Related Materials", University of Sussex, Sept. 9-11, 1998.
- Sept. 1998 "Aligned Carbon Nanotubes". Presented at the 14<sup>th</sup>. International Congress on Electron Microscopy (Cancún, México, 31 Aug- 4 Sept. 1998).
- Aug. 1998 "Production of Aligned Doped Carbon Nanotubes and Metal Nanowires". Presented at the International Meeting on Materials Science; Synthesis and Applications of Fullerene and Nanotubes (Cancún, México, 30 Aug.-4 Sept. 1998). Invited speaker.
- Apr. 1998 "Carbon self assembly: Formation of Aligned Nanotubes". Presented at the British Carbon Conference, University of Bath-UK, 15-16 April 1998). Invited speaker.
- Mar. 1998 "Nanotechnology of Nanotubes and Nanowires: From Carbon Nanotubes to Silicon Oxide Nanowires". Presented at Euroconference on Molecular Nanostructures, Kirchberg / Tirol Austria International Winterschool on Electronic Properties of Novel Materials IWEPM 98 (1-7 March, 1998). Invited speaker.
- Feb. 1998 "Novel routes to Nanotubes and Nanowires". Presented at the Max Planck Institut für Metallforschung (Stuttgart, Germany 23 February). Invited speaker.
- Jan. 1998 "Nanotechnology of Nanowires and Nanotubes". Presented at the XII Latin American Conference in Solid State Physics (Oaxaca, Mexico, 11-16 January 1998). Invited speaker.
- Dec. 1997 "Fullerenes and Nanotubes". Presented at the Defence Evaluation Research Agency (DERA-Malvern; Electronic Materials and Characterisation). Invited speaker (Malvern, UK, 3 December 1997).
- Sept. 1997 "Advances in the creation of Novel Nanoscale Materials". Presented at the 3<sup>rd</sup> Human Capital and Mobility (HCM) Workshop on "Formation, Stability and Photophysics of Fullerenes" (Brugge, Belgium, 17-21 September 1997).
- May 1997 "Production of Novel B<sub>x</sub>C<sub>y</sub>N<sub>z</sub> Nanomaterials and Metal Nanowires". Presented at the Electrochemical Society 191st. meeting (Montreal-Quebec, May 4-9, Canada).
- Jan. 1997 "Fullerenes: A New Form of Carbon". Presented at Universidad Iberoamericana, Mexico City, México.
- Jan. 1997 "Fullerenes: A New Form of Carbon". Presented at the Sotero Prieto Seminar Series, Instituto de Física, UNAM-MEXICO (México)
- Dec. 1996 "Production and Characterisation of Novel Fullerene-related Nanostructures: Nanofibres, Nanowires and Nanotubes". Presented at the Physics Department, Universidad Autónoma de San Luis Potosí, San Luis Potosí, México.
- March 1996 \* "Morphology effects of catalytic particles in pyrolytic grown B<sub>x</sub>C<sub>y</sub>N<sub>z</sub> nanofibres and nanotubes". Presented at the Euroconference on Fullerenes and Fullerene Nanostructures, Kirchberg / Tirol Austria



International Winterschool on Electronic Properties of Novel Materials IWEPNM 96.

\* "Production of carbon nanotubes and graphitic onions by condensed phase electrolysis". Presented at the Euroconference on Fullerenes and Fullerene Nanostructures, Kirchberg / Tirol Austria International Winterschool on Electronic Properties of Novel Materials IWEPNM 96.

- Jan. 1996 "New graphitic structures and their physico-chemical implications". Presented at the Sotero Prieto Seminar Series, Instituto de Física, UNAM-MEXICO
- Nov. 1995 "New graphitic structures and their physico-chemical implications". Presented at the Chemical Physics Seminar, University of Sussex.
- May 1995 "Physico-chemical studies on Nanotubes and their encapsulated compounds". Presented at The Electrochemical Society 187th. Meeting (Reno, Nevada, USA).  
\* Vice-chairman in the Nano-encapsulates session.
- March 1995 "New observations on Carbon Nanotubes". Presented at The Southern Spectroscopy group Meeting, University of Bristol.
- Apr. 1992 "Asymptotic Analysis of a Model Integro-Differential Equation that Exhibits Travelling Wave Solutions". Presented at the Leopoldo García-Colin Seminar Series Universidad Iberoamericana.

#### VIII. POSTERS AND OTHER PRESENTATIONS

- Jul. 2000 *Coating of Carbon Nanotubes*. Seeger, T., Kohler-Redlich, Ph., Grobert, N., Terrones, M., Walton, D. R. M., Kroto, H. W., Rühle, M. EUROCARBON 2000, Vol. 2, 1033-1034, Berlin, Germany, 9-13/07/2000.
- Jul. 2000 *A novel route to Iron-filled Nanowires*, Grobert, N., Terrones, H., Hsu, W.K., Zhu, Y. Q., Walton, D. R. M., Kroto, H. W., Terrones, M., Han, W. Q., Kohler-Redlich, Ph., Seeger, T., Rühle, M., Morales, F., Escudero, R. EUROCARBON 2000, Vol. 2, 1033-1034, Berlin, Germany, 9-13/07/2000.
- Nov. 1999 *Metal chalcogenide nanotubes: structure and electronic properties*, Seifert, G., Jungnickel, G., Frauenheim, T., Terrones, H. and Terrones, M. Proceeding of ISCAN meeting (USA, nov. 1999. Poster).
- Sept. 1999 *On the structure and electronic structure of MoS<sub>2</sub> nanotubes*, Seifert, G., Jungnickel, G., Terrones, H., Terrones, M. and Frauenheim, Th., NanoteC99, Brighton, England (8-10 september 1999. Talk).
- Sept. 1999 *Self assembly generation of Si-based nanostructures*. Zhu, Y.Q., Hu, W.B., Hsu, W.K., Terrones, H., Terrones, M., Grobert, N., Hare, J.P., Kroto, H.W. and Walton, D.R.M., NanoteC99, Brighton, England (8-10 September 1999. Talk)
- Sept. 1999 *New Metallic Allotropes of Planar and Tubular Carbon: Haeckelites*. Terrones H., Terrones, M., Hernández, E., Grobert, N., Charlier, J.C.C. and Ajayan, P.M.A., NanoteC99, Brighton, England (8-10 september 1999, Talk).
- Ago. 1999 *A New Form of Crystalline Layered Carbon: Characterisation, Stability and*

- Electronic Properties.* Terrones, M., Charlier, J-C, Grobert, N., Ajayan, P.M. and Terrones, H., XVIII Congress of the International Union of Crystallography, (Glasgow, Scotland, 4-13 august 1999. Poster).
- Abr. 1999 *Atomic self-assemble generation of aligned carbon nanotube films and silica nanowires.* Terrones, M., Grobert, N., Zhu, Y.Q., Hsu, W.K., Trasobares, S., Hare, J.P., Kroto, H.W., Walton, D.R.M., and Terrones, H. Nanocomposite Materials Design and Applications, (Anchorage, Alaska USA) 03/04/1999.
- Abr. 1999 *In-situ filling of carbon nanotubes: generation of ferromagnetic nanowires.* Grobert, N., Terrones, M., Zhu, Y.Q., Hsu, W.K., Trasobares, S., Hare, J.P., Walton, D.R.M., Kroto, H.W. and Terrones, H. Nanocomposite Materials Design and Applications, (Anchorage, Alaska USA) 03/04/1999.
- Sep. 1999 *New Metallic Allotropes of Planar and Tubular Carbon: Haeckelites.* Terrones H., Terrones, M., Hernández, E., Grobert, N., Charlier, J.C.C. and Ajayan, P.M. NanoteC99 (Brighton, England) 09/09/1999.
- Sep. 1999 *Self assembly generation of Si-based nanostructures.* Zhu, Y.Q., Hu, W.B., Hsu, W.K., Terrones, H., Terrones, M., Grobert, N., Hare, J.P., Kroto, H.W. and Walton, D.R.M. NanoteC99 (Brighton, England) 08/09/1999.
- Sep. 1999 *On the structure and electronic structure of MoS<sub>2</sub> nanotubes.* Seifert, G., Jungnickel, G., Terrones, H., Terrones, M. and Freuenheim, Th. NanoteC99 (Brighton, England) 09/09/1999.
- Nov. 1999 *Metal chalcogenide nanotubes: structure and electronic properties.* Seifert, G., Jungnickel, G., Frauenheim, T., Terrones, H. and Terrones, M. Proceeding of ISCAN meeting (USA) 10/11/1999.
- Sep. 1998 *"Recent advances in the synthesis and characterizations of B-doped carbon nanotubes",* Ph. Redlich, W.K. Hsu and M. Terrones. Presented in the workshop entitled: Simulation of carbon and composite B<sub>x</sub>C<sub>y</sub>N<sub>z</sub> nanotubes. CECAM, Lyon, France 1-3 September, 1998
- Sep. 1998 *"Metal-Catalysed growth of carbon nanotubes",* D. J. Wallis, N. Grobert, C. L. Reeves, A. J. Pidduck, D. R. M. Walton, J. P. Hare, W. K. Hsu, M. Terrones, H. W. Kroto, P. J. Wright, C. Vizard. Poster presented at the 14<sup>th</sup>. International Congress on Electron Microscopy Cancún, México, August 31- September 4 1998.
- Aug. 1998 *"Electrolytic Formation of Metal Nanowires",* W. K. Hsu, M. Terrones, H. Terrones, N. Grobert, Y. Q. Zhu, J. P. Hare, H. W. Kroto, D. R. M. Walton. Poster presented at the 14<sup>th</sup>. International Congress on Electron Microscopy (Cancún, México, 31 Aug- 4 Sept. 1998).
- May. 1998 *"Controlled Production of Aligned Carbon Nanotubes".* M. Terrones. Poster presented at the Advanced Study Institute (AIS) in design and control of structure of advanced carbon materials for enhanced performance. Antalya, Turkey 9<sup>th</sup>-21<sup>st</sup> May 1998.
- Apr. 1998 *"Geometry and Energetics of High Genus Fullerenes and Nanotubes",* H. Terrones & M. Terrones. Workshop on Discrete Mathematical Chemistry at the Centre for Discrete Mathematics and Theoretical Computer Science (DIMACS), Rutgers University NJ, USA, 23-25 March 1998.

- Aug. 1997 *"Radio-Thermoluminescence Spectra of Fullerenes"*, A. P. Rowlands, M. Terrones, P. D. Townsend, K. Kordatos. Electrochemical Society Meeting, Paris, France, August 31- September 5 1997. In *Luminescent materials VI.*,
- June 1997 *"Fullerenes and Nanotubes with Non-Positive Gaussian Curvature"*, H. Terrones and M. Terrones. International Conference on Advanced Materials (ICAM 97), Symposium A: Fullerenes and Carbon Based Materials, Strasbourg, France, (16-20 June 1997).
- May 1997 *"Structure and Electronic Properties of High Genus Fullerenes with Non-positive Gaussian Curvature"*, H. Terrones, J. L. Ricardo-Chávez, J. Dorantes-Dávila, M. Terrones. 191st. Electrochemical Society Meeting, Montreal, Canada, May 4-9, 1997.
- May 1997 *"LDF Calculations on Large Fullerenes and Onions"*, M.I. Heggie, M. Terrones, B. R. Eggen, H. Terrones, G. Jungnickel, R. Jones, P. R. Briddon. 191st. Electrochemical Society Meeting, Montreal, Canada, May 4-9, 1997.
- March 1997 *"Controlled Production of Nanotubes via Pyrolytic Techniques"*, M. Terrones, N. Grobert, J. Olivares, K. Kordatos, W.K. Hsu, J. P. Zhang, H. Terrones, J. P. Hare, P. D. Townsend, K. Prassides, A. K. Cheetham, H. W. Kroto, D. R. M. Walton. Presented at the Euroconference on Fullerenes and Fullerenes related Materials, Kirchberg / Tirol Austria International Winterschool on Electronic Properties of Novel Materials IWEPMN 97.
- March 1997 *"Production and Characterisation of Metal Nanowires by Condensed-Phase Electrolysis"*, W. K. Hsu, M. Terrones, H. Terrones, J. P. Hare, N. Grobert, A. I. Kirkland, H. W. Kroto, D. R. M. Walton. Presented at the Euroconference on Fullerenes and Fullerenes related Materials, Kirchberg / Tirol Austria International Winterschool on Electronic Properties of Novel Materials IWEPMN 97.
- Dec. 1996 *"Quasicrystalline Graphite Sheets and High Genus Fullerenes with Non-Positive Gaussian Curvature"*, H. Terrones and M. Terrones, Symposium D, 1996 MRS (Materials Research Society) Fall Meeting, Boston, MA, December 2-6 1996.
- Oct. 1996 *"Know your onions!; Reliable Calculations in Materials Science"* Heggie, M. I., Eggen, B. R., Terrones, M., Jungnickel, G., Latham, C. D., Jones, R., Briddon, P. R., Terrones, H. Consortium e6; Ab Initio Simulations of Covalent Materials, EPSRC High Performance Computing Initiative, Town Meeting. U.K.
- Sept. 1996 *"LDF calculations on large fullerenes and onions"* Heggie, M. I., Eggen B. R., Terrones, M., Jungnickel, G., Latham, C. D., Jones, R., Briddon, P. R. Network Conference; Ab initio calculations of complex processes in materials. Schwäbisch Gmünd, Germany.
- August 1996 *"Geometry and Stability of Graphitic Onion-Like Structures"*, H. Terrones and M. Terrones, International Union of Crystallography XVII Congress and General Assembly, Seattle, WA, USA, august 8-17 1996.
- July 1996 *"The Role of Defects in Fullerene-related Structures"* Terrones, H., Terrones, M., Fullerenes 96, Oxford, U. K.
- Dec. 1995 *"Growth Mechanism for Graphitic Onions"* Terrones, H and Terrones, M.

Materials Research Society (MRS) Fall Meeting. Boston, MA, USA

- Sept 1995 *"The Role of Boron Nitride in the Production of Long Graphite Nanotubes"* Terrones, H., García-Cruz R., Castillo R., Ramos, S., Terrones, M., Hsu, W. K., Prassides, K., Walton, D. R. M., Kroto, H. W. IV International Conference on Advanced. Cancún, México.
- Sept. 1995 *"Symmetry and Energy Studies on Defective Graphitic Particles: A new approach to explain bucky-onion growth"* Terrones, H and Terrones, M. IV International Conference on Advanced Materials. Cancún, México.
- June 1995 *"Fullerene based Materials Science at Sussex"*. Hare, J. P., Hsu, W. K., Terrones, M., Sarkar, A., Firth, S. G., Lappas, A., Abeyasinghe, J. R., Kroto, H. W., Prassides, K., Taylor, R. and Walton D. R. M. 1995. St. Petersburg Conference.

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## **LIST OF PUBLICATIONS**

**MAURICIO TERRONES**

## PUBLICATIONS

### A) Books

- 1) Terrones, M. & Terrones, H. (Eds) "Nanotechnology of Carbon and Related Materials" Philosophical Transactions, *The Royal Society (UK)*, October 2004.

### B) Patents

- 1) Title: Mesoporous Boron Nitride Materials and Their Preparation Methods Inventors: Ajayan Vinu, Katsuhiko Ariga, Mauricio Terrones, Dimitri Golberg, Toshiyuki Mori.  
Application number: 2005-212474 (Japanese patent).

### C) Articles in refereed journals and contributions to books

- 1) Rodríguez-Manzo, J.A., Terrones, M., Terrones, H., Kroto, H.W., Sun, L., Banhart, F. (2007) "In-situ nucleation of carbon nanotubes by the injection of carbon atoms into metal particles". *Nature Nanotechnology* 2, 307-311.
- 2) Romo-Herrera, J.M., Terrones, M., Terrones, H., Dag, S., Meunier, V. (2007). "Covalent 2D and 3D Networks from 1D Nanostructures: Designing New Materials". *Nano Letters* 7, 570-576.
- 3) Rodríguez-Manzo, J. A., López-Urías, F., Terrones, M., Terrones, H. (2007) "Anomalous Paramagnetism in Doped Carbon Nanostructures". *Small* 3, 120-125.
- 4) Terrones H. & Terrones, M. "The Shape of Carbon Novel Materials for the 21<sup>st</sup> Century" . In WSPC Advanced in Nanoengineering. Ed. G. Davies. World Scientific. Singapore 2007, in press.
- 5) Muramatsu, H, Hayashi, T, Kim Y.A., Terrones, M., Endo, M. (2006). "Formation of off-centered double-walled carbon nanotubes exhibiting wide interlayer spacing from bi-cables". *Chemical Physics Letters* 432, 240-244.
- 6) Ayala, P., Freire, F. L., Gu, L., Smith, D. J., Solorzano, I.G., Macedo, D.W., Vander Sande, J.B., Terrones, H., Rodríguez-Manzo, J., Terrones, M. (2006) "Decorating carbon nanotubes with nanostructured nickel particles via chemical methods". *Chemical Physics Letters* 431: 104-109.
- 7) López-Urías, F., Rodríguez-Manzo, J. A., Muñoz-Sandoval, E., Terrones, M., Terrones, H. (2006) "Magnetic response in finite carbon graphene sheets and nanotubes". *Optical Materials* 29: 110-115.
- 8) Kim, Y.A., Muramatsu, H., Hayashi, T., Endo, M. Terrones, M., Dresselhaus, M.S. (2006). "Fabrication of high-purity, double-walled carbon nanotube buckypaper". *Chemical Vapor Deposition* 12: 327-330.
- 9) Endo, M., Takeuchi, K., Tajiri, T., Park, K.C., Wang, F., Kim, Y.A., Hayashi, T., Terrones, M., Dresselhaus, M.S. (2006). "Sodium chloride-catalyzed oxidation of multiwalled carbon nanotubes for environmental benefit". *Journal of Physical Chemistry B* 110, 12017-12021.
- 10) Sun, L., Banhart, F., Krahennikov, A.V., Rodríguez-Manzo, J.A., Terrones, M., Ajayan, P.M. (2006). "Carbon Nanotubes as High Pressure Cylinders and Nanoextruders". *Science* 312, 1199-1202.
- 11) Endo, M., Kim, Y.A., Hayashi, T., Muramatsu, H., Terrones, M., Saito, R., Villalpando-Paez, F., Chuo, S. G., Dresselhaus, M.S. (2006). "Nanotube Coalescence-Inducing Mode: A Novel Vibrational Mode in Carbon Systems". *Small* 2, in press.
- 12) Fantini, C., Cruz, E., Jorio, A., Terrones, M., Terrones, H., Van Lier, G., Charlier, J.-C., Dresselhaus, M. S., Saito, R., Kim, Y.A., Hayashi, T., Muramatsu, H., Endo, M., Pimenta, M.A. (2006). "Resonant Raman Study of linear chains formed by the heat treatment of double-wall carbon nanotubes". *Physical Review B (Brief Reports)* 73, in press.
- 13) Carrero-Sánchez, J.L., Elías, A.L., Mancilla, R., Arellín, G., Terrones, H., Lacleste, J.P., Terrones, M. (2006). "Biocompatibility and Toxicological Studies of Carbon Nanotubes doped with Nitrogen". *Nano Letters*, in press.
- 14) Villalpando-Paez, F., Zamudio, A., Elías, A.L., Son, H., Barros, E.B., Chou, S. G., Kim, Y.A., Muramatsu, H., Hayashi, T., Kong, J., Terrones, H., Dresselhaus, G., Endo, M., Terrones, M., Dresselhaus, M.S. (2006). "Synthesis and characterization of long strands of nitrogen-doped single-walled carbon nanotubes". *Chemical Physics Letters*, in press.
- 15) Castañeda, L., García-Valenzuela, A., Zironi, E.P., Canetas-Ortega, J., Terrones, M., Maldonado, A. (2006). "Formation of indium-doped zinc oxide thin films using chemical spray techniques: The importance of acetic acid content in the aerosol solution and the substrate temperature for enhancing electrical transport". *Thin Solid Films* 503, 212-218.
- 16) Kim, Y.A., Muramatsu, H., Hayashi, T., Endo, M., Terrones, M., Dresselhaus, M.S. (2006) "The possible way to Evaluate the Purity of Double Walled Carbon Nanotubes over Single Wall Carbon Nanotubes by Chemical Doping". *Chemical Physics Letters* 420 (4-6): 377-381.
- 17) Terrones, H., López-Urías, F., Muñoz-Sandoval, E., Rodríguez-Manzo, J.A., Zamudio, A., Elías, A.L. and Terrones, M. (2005). "Magnetism in Fe-based and Carbon Nanostructures: Theory and Applications". *Solid State Sciences* 8 303-320.
- 18) Muramatsu, H., Hayashi, T., Kim, Y.A., Shimamoto, D., Kim, Y.J., Tantrakarn, K., Endo, M., Terrones, M., Dresselhaus, M.S. (2005) "Pore structure and oxidation stability of double-walled carbon nanotube-derived bucky paper". *Chemical Physics Letters* 414, 444-448
- 19) Kim, Y.A., Kojima, M., Muramatsu, H., Umemoto, S., Watanabe, T., Yoshida, K., Sato, K., Ikeda, T., Hayashi, T., Endo, M., Terrones, M., Dresselhaus, M.S. (2005) "In-situ Raman study on single- and double-walled carbon nanotubes as a function of Lithium Insertion". *Small* 2, 667-676
- 20) Zamudio, A., Elías, A.L. Rodríguez-Manzo, J.A., López-Urías, F., Rodríguez-Gattorno, G., Lupo, F.,

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#### E) Book Reviews and other miscellaneous publications

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- 3) Terrones, M. "Composite Materials for Electronic Functions" (by D. D. L. Chung). *Zeitschrift für Metallkunde*, *in press* (2002).
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- 5) Terrones, M. (2001) "El universo de la Nanotecnología" (interview), Published in the Science section, La Jornada (*Newspaper*, pp III, January 22<sup>th</sup>, 2001).
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#### **X. REFEREE IN INTERNATIONAL JOURNALS**

1. Chemical Physics Letters	(45)
2. Physical Review Letters	(48)
3. Applied Physics Letters	(31)
4. Advanced Materials	(52)
5. Advanced Functional Materials	(8)
6. Chemical Physics Physical Chemistry	(19)
7. Carbon	(80)
8. Chemistry of Materials	(23)
9. Journal of Materials Chemistry	(48)
10. Journal of Physical Chemistry	(15)
11. Physical Review B (rapid)	(18)
12. Chemical Communications	(170)
13. Science	(2)
14. Synthetic Metals	(1)
15. Thin Solid Films	(3)
16. European Journal of Physics B (Condensed Matter)	(1)

#### **XI. REFEREE IN SUBJECT BOOKS**

1. Graphite and Precursors (Ed. P. Delhaes)
2. Carbon Nanotubes and Related Structures (P.J.F. Harris) - Journal *Carbon*.
3. Composite Materials for Electronic Functions (D. D. L. Chung) – Journal *Zeitschrift für Metallkunde*.

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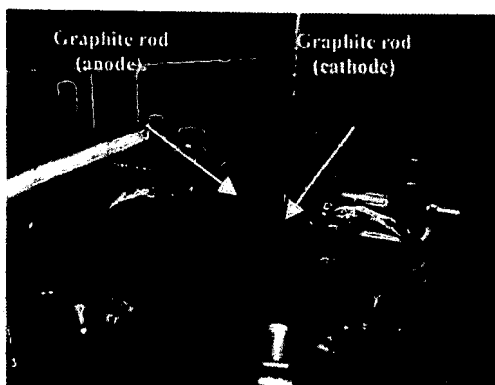
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**INDEPENDENT CITATIONS**

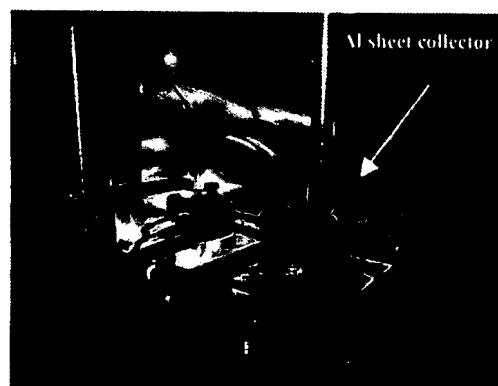
**MORE THAN 3286**

**(AS OF MAY 2006)**





Position of the graphite rods for the resistive heating experiment. The anode showed a reduced diameter of 5 mm. The right rod exhibited a diameter of 1/4 inch (cathode).



We used an aluminum sheet in a semicircle as a soot collector after the resistive heating experiments.



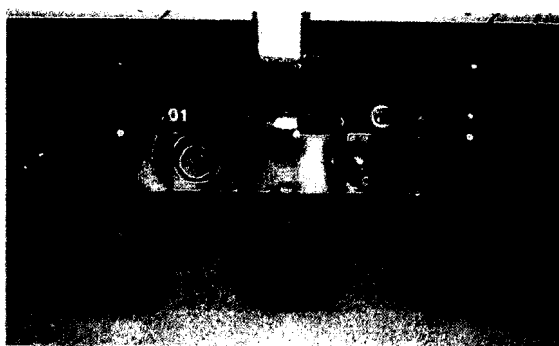
Photograph of the experimental setup for the resistive heating experiments. The chamber was filled with helium at 100 torr pressure.



Photograph of the resistive heating experiment: Current: 100 amps, reaction time: 1.52 minutes



View of the jar bell (top-left image) and interior chamber (top-right) after the resistive heating reaction. It is possible to observe the graphite rods and soot deposited over the bell jar and on the Al collector.



Photographs of soot collected from different parts of the chamber: A) sample collected from the plate; B) soot collected from the semicircular aluminum collector; C) carbon soot collected from the bell jar; D) graphite rod with reduced diameter (anode), see the "graphite crown" at the tip, and E) graphite rod (cathode) after the reaction.



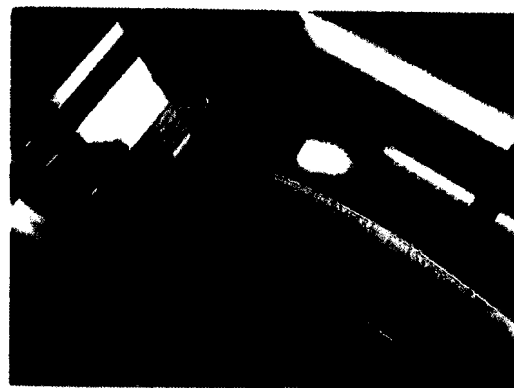
Position of the graphite rods in the left reduce in diameter tool by 5 mm diameter in the right and with diameter of 12 mm (cathode)



We used an aluminum sheet as semicircle and a graphite rods collector (cathode)

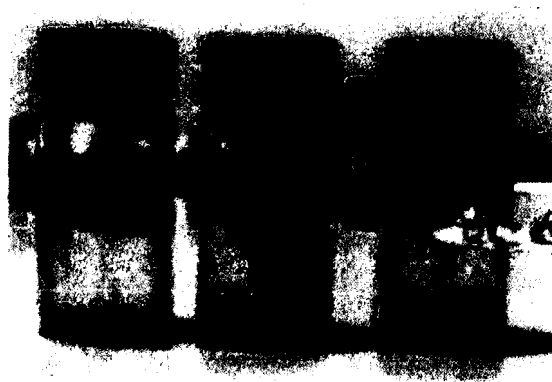


Left image show the reactor during the filled and vacuum Helium before the reaction. In the image of the right we can see the reactor at the end of the reaction. In this image we can see the reactor at the end of the reaction.





After the reaction for both experiments, we can see the specimen (graphite soot) over the plate and coated the walls of the reactor



After remove the graphite soot by seraping A) specimen over the surface plate bottom, B) specimen coated the semicircle aluminum piece (the plate), C) graphite soot of the walls of interior reactor